

75. (Added) The method according to claim 11, wherein said temperature is between about 250°C and 400°C.

105 76. (Added) The method according to claim 67, wherein said catalyst comprises niobium oxide and tantalum oxide.

77. (Added) The method according to claim 73, wherein said temperature is between about 250°C and 400°C.

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REMARKS

The Amendments

Applicant has amended the first sentence of the specification to clarify that the instant application is a continuation of United States Application No. 09/255,371. Support for this amendment may be found on page 1 of the transmittal letter that accompanied the filing of the instant application on March 22, 2001.

In order to more particularly point out and distinctly claim the invention, applicant has cancelled claims 1-5, 7, 12 and 68, added claims 70-77, and amended claims 6, 11 and 69.

Support for the amendments to claims 6, 11 and 69 is found throughout the specification. See, e.g., page 7, lines 18-23; page 8, lines 3-9, Examples 9-10 on pages 17, line 5 to page 18, line 29; and originally-filed claim 54. Support for added claims 70-77 is found throughout the specification. See, e.g., page 1, lines 10-11; page 5, lines 23-24; page 7, lines 23-24; and originally-filed claim 16. None of the amendments adds new matter. Their entry is requested.

Claims 6, 8-11, 13-15, 67 and 69-77 are pending in the present application. Without acquiescing to the rejections of the previously pending claims, applicant will address the response with respect to the pending claims only.

7 Applicant reserves the right to continue to prosecute and to obtain claims to the cancelled subject matter in other applications claiming priority herefrom.

The Information Disclosure Statement

The Examiner states that the Information Disclosure Statement signed March 22, 2001 fails to comply with 37 C.F.R. §§ 1.97 and 1.98 and MPEP § 609 because there were no references to consider. Applicant traverses.

Pursuant to 37 C.F.R. § 1.98(d), applicant did not submit copies of the references listed on the March 22, 2001 Information Disclosure Statement because copies of the references were provided in an earlier filed United States patent application, 09/255,371 ("the '371 application"), filed February 22, 1999, now United States Patent 6,355,854 ("the '854 patent").

Pursuant to 37 C.F.R. § 1.98(d)(1), the '371 application is properly identified in the Information Disclosure Statement (see page 2 of the Information Disclosure Statement, attached as Exhibit A) and is relied on for an earlier effective filing date under 35 U.S.C. § 120 (see Transmittal Letter for Continuation Application, attached as Exhibit B, and copy of filing receipt, attached as Exhibit C).

Further, pursuant to 37 C.F.R. § 1.98(d)(2), the Information Disclosure Statement submitted in the '371 application complied with 37 C.F.R. § 1.98(a)-(c), as

substantiated by the fact that all of the references are cited on the face of the '854 patent, either as being cited by the applicant or the Examiner (see front page of the '854 patent, attached as Exhibit D).

As applicant has complied with the requirements of 37 C.F.R. § 1.98(d) as detailed above, applicant respectfully requests that the Examiner review the references cited in the March 22, 2001 Information Disclosure Statement, return an initialed copy of Form PTO-1449 with the next communication, and list these references on any patent that may issue from the above-identified application.

#### Double Patenting Rejections

The Examiner has rejected claims 1-15 and 67-69 under the judicially created doctrine of obviousness-type double patenting, as allegedly being unpatentable over claims 1-55 of the '854 patent. The Examiner also has provisionally rejected claims 1-15 and 67-69 under the judicially created doctrine of obviousness-type double patenting, as allegedly being unpatentable over claims 1-39, 41-44, 46-77, 74, 78, 79, 81-88, and 99 of copending United States application 09/510,458 ("the '458 application").<sup>1</sup>

Applicant will file a Terminal Disclaimer in compliance with 37 C.F.R. § 1.321(c) upon notice that the claims are otherwise in condition for allowance.

#### Rejections under 35 U.S.C. § 112, First Paragraph

The Examiner has rejected claims 1-15 and 68 under 35 U.S.C. § 112, first paragraph. The Examiner states that the specification "does not reasonably provide

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<sup>1</sup> Applicant notes that the '458 patent has issued as United States Patent 6,417,422 B1.

enablement for a dehydrogenation process having a selectivity of greater than 70% and a conversion of greater than 10% by using a catalyst containing nickel oxide at a non specific [sic] operating temperature.” The Examiner further contends that the process of claims 1-15 and 68 does not recite the composition of each metal oxide in the catalyst to provide the selectivity and conversion rates. Applicant traverses in view of the amendments to the claims, considered together with the following remarks.

Applicant has amended claim 11 to recite that the claimed process is performed at a temperature of about 400°C or less. Further, applicant has amended claims 6 and 11 to recite that the claimed oxidative dehydrogenation from an alkane to an alkene is conducted in the presence of the alkene. Applicant has specifically exemplified the preparation and reactivity of a number of nickel oxide catalysts with alkanes in the presence of the corresponding alkene and demonstrated that virtually all catalysts comprising at least 50% nickel oxide in the claimed process produce a selectivity of greater than about 70% and a conversion of greater than about 10% at a temperature of about 400°C or less. See, e.g., Examples 9-10, specification page 17, line 5 to page 18, line 29, and Tables 22-26 and 30-34, specification pages 38-42.

Further, although Examples 9 and 10 exemplify a process of using nickel oxide catalysts that comprise both niobium oxide and tantalum oxide, one having ordinary skill in the art would reasonably expect that any catalyst comprising at least 50% nickel oxide by weight would have the claimed selectivity and conversion rates based upon the teachings of the specification. Specifically, the specification teaches and exemplifies that nickel oxide catalysts comprising either niobium oxide or tantalum oxide, and even

catalysts comprising nickel oxide alone, have catalytic activity comparable to a catalyst comprising all three components. See, e.g., Example 11, specification page 19, line 1 to page 20, line 3, and Tables 38-42, specification pages 44-45. Thus, contrary to the Examiner's assertion, the specification teaches a person of ordinary skill in the art how to make and use the full scope of the claimed invention without undue experimentation.

The Examiner also has rejected claims 1-5 and 68 as allegedly not being enabled because the Examiner states that oxygen is essential or critical to the practice of the invention but is not included in the claim.

As discussed above, applicant has cancelled claims 1-5 and 68, thus obviating this aspect of the rejection.

The Examiner has rejected claims 68 and 69 under 35 U.S.C. § 112, first paragraph as containing subject matter that is allegedly not described in the specification in such a way as to reasonably convey to one skilled in the art at the time the application was filed that the inventor had possession of the claimed invention. Specifically, the Examiner states that the limitation of "at a temperature of less than or equal to about 400°C" was not described. Applicant traverses in view of the amendments to the claims, considered together with the following remarks.

Applicant has amended claim 69 to recite the same claim language as that in originally-filed claim 54, which recites contacting the catalyst to ethane and oxygen "at a temperature about 400°C or less", thus obviating the rejection.

Rejection under 35 U.S.C. § 112, Second Paragraph

The Examiner has rejected claims 1-15 and 67-69 under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. In particular, the Examiner asserts that the term "at least **about** 50% nickel oxide" in claims 1 and 67 renders the claims indefinite because the expression includes values above and below 50%. Applicant traverses.

Recitation of the word "about" along with the specified range does not render the claims unclear or indefinite. As discussed in the October 9, 2002 Response, the word "about" has been deemed acceptable claim language. Although the term "at least about" may be indefinite where there is close prior art and nothing in the specification, file history or prior art to provide any indication of the range of the specific activity covered by the term, this is not the case here. See MPEP 2173.05(b), citing Amgen v. Chugai Pharmaceutical Co. 927 F.2d 1200, 18 USPQ2d 1016 (Fed. Cir. 1991). Rather, there is no close prior art to the claimed invention and the specification and the pending claims clearly define that the catalyst must have particular specific activities, such that one of ordinary skill in the art being apprised of the invention could determine the scope of the term. Thus, applicant's use of the word "at least about" to modify the claimed range does not render the claim indefinite. Accordingly, applicant requests that the Examiner withdraw the 35 U.S.C. § 112, second paragraph rejection.

Rejections under 35 U.S.C. § 103(a)

The Examiner has rejected claims 1-5, 11-13 and 15 under 35 U.S.C. § 103(a), as allegedly being unpatentable over Ji et al., React. Kinet. Catal., 62(1), pp. 121-128 (1997) ("Ji").

The Examiner asserts that "Ji discloses an oxidative dehydrogenation process to convert ethane to ethylene, in the presence of oxygen, with a catalyst comprising nickel oxide. The selectivity and the conversion of the process are greater than 85% and 15%, respectively." Office Action, page 6. The Examiner acknowledges that Ji does not disclose using a catalyst comprising at least 50% of nickel oxide, but states that it would have been an obvious to one of ordinary skill in the art at the time the invention was made to modify the Ji process because "it is known in the art that a catalyst comprising nickel oxide is effective in an oxidative dehydrogenation process to convert ethane to ethylene." *Id.* Applicant traverses.

Ji does not teach or suggest a process for the oxidative dehydrogenation of an alkane to a corresponding alkene in which the alkane mixture is contacted to the catalyst in the presence of the corresponding alkene. In addition, Ji does not teach or suggest conducting the process at a temperature of less than or equal to about 400°C, but refers only to methods of oxidative dehydrogenation at temperatures of greater than 550°C. Further, Ji does not teach or suggest using catalysts having more than about 33% nickel oxide. See, Ji, page 122. Finally, Ji does not provide the requisite motivation to modify the Ji process to the claimed process.

For at least the reasons detailed above, Ji fails to render applicant's claims obvious. Accordingly, applicant requests that the Examiner withdraw the 35 U.S.C. § 103(a) rejection of claims 11-13 and 15.

CONCLUSION

In view of the foregoing amendments and remarks, applicant requests that the Examiner withdraw the claim rejections and allow all claims of this application. If the Examiner believes that an interview would facilitate the resolution of any outstanding issues, he is kindly requested to contact the undersigned.

Respectfully submitted,



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## APPENDIX TO AMENDMENTS

6. (Three times amended) A process for the oxidative dehydrogenation of an alkane having from 2 to 4 carbon atoms to an alkene, comprising  
contacting said alkane in the presence of oxygen to a compound that includes at least about 50% nickel oxide by weight at a temperature of [less than or equal to] about 400°C or less, wherein said contacting is conducted in the presence of said alkene,  
and

obtaining a selectivity in said dehydrogenation of greater than 70%  
and a conversion of greater than 10%.

11. (Twice Amended) A process for the oxidative dehydrogenation of an alkane having from 2 to 4 carbon atoms to an alkene, comprising  
providing a reactor and a reactor feed comprising a gas mixture,  
wherein said gas mixture comprises said alkane, said alkene and oxygen;

contacting [a] said gas mixture [comprising said alkane and oxygen]  
to a catalyst that includes at least about 50% nickel oxide in said reactor, wherein said  
contacting is performed at a temperature of about 400°C or less; and  
obtaining a selectivity greater than 70% and a conversion greater than  
10%.

69. (Amended) The method according to claim 67, wherein the  
contacting step is carried out at a temperature of [less than or equal to] about 400°C or less.